AMENDMENTS TO CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1-50. (Canceled)

51. (Previously Presented) A spherical semiconductor particles mass-producing method comprising the steps of:

storing a semiconductor in a crucible;

heating and melting the semiconductor in the crucible by heating means;

dropping a molten semiconductor coming from the crucible from a nozzle in a vapor phase; and

vibrating the molten semiconductor in the crucible or the molten semiconductor dropped in the vapor phase by vibrating means.

52. (Previously Presented) The spherical semiconductor particles mass-producing method of claim 51, further comprising:

pressuring the molten semiconductor in the crucible by pressuring means.

53. (Previously Presented) The spherical semiconductor particles mass-producing method of claim 52, wherein the pressurizing means is a gas source for supplying an inert gas having a pressure higher than atmospheric pressure to a space over the semiconductor in the crucible.

54. (Previously Presented) The spherical semiconductor particles mass-producing method of claim 51, wherein a pressure of a space with which an outlet of the nozzle communicates is selected to be lower than that of a space over the semiconductor in the crucible does.

55. (Previously Presented) The spherical semiconductor particles mass-producing method of claim 51, wherein a plurality of the nozzles are provided and each of the nozzles has an inner diameter of 1 ± 0.5 mm and a length of I mm to 100 mm.

56. (Previously Presented) The spherical semiconductor particles mass-producing method of claim 55, wherein each of the nozzles has a length of 5 mm to 10 mm.

57. (Previously Presented) The spherical semiconductor particles mass-producing method of claim 51 , wherein the heating means comprises an induction heating coil provided in the vicinity of the crucible and a high-frequency power source for energizing the induction heating coil.

58. (Previously Presented) The spherical semiconductor particles mass-producing method of claim 51, wherein the heating means is resistive heating means for heating the crucible.

59. (Previously Presented) . The spherical semiconductor particles mass-producing method of claim 51, wherein the vibrating means has a vibration frequency of 10 Hz to I kHz.

60. (Previously Presented) The spherical semiconductor particles mass-producing method of claim 51, wherein the vibrating means applies sound waves or ultrasonic waves to the dropping molten semiconductor and thereby vibrate the dropping molten semiconductor.

61. (Previously Presented) The spherical semiconductor particles mass-producing method of claim 51, wherein the nozzle is vibratory, and the vibrating means vibrates the nozzle by reciprocating.

62. (Previously Presented) The spherical semiconductor particles mass-producing method of claim 61, wherein the vibrating means drives the nozzle so that an outlet of the nozzle vibrates in a direction perpendicular to the axial line of the nozzle at an amplitude A that is smaller than 1/2 of an outer diameter D1 of particles to be formed.

63. (Previously Presented) The spherical semiconductor particles mass-producing method of claim 61, wherein the vibrating means vibrates the nozzle along the axial line of the nozzle.

64. (Previously Presented) The spherical semiconductor particles mass-producing method of claim 51, wherein the vibrating means is pressure varying means for varying a pressure of a space over the semiconductor in the crucible.

65. (Previously Presented) The spherical semiconductor particles mass-producing method of claim 64, wherein the vibrating means comprising:

a diaphragm provided so as to communicate with the space over the semiconductor in the crucible, and a driving source for reciprocating the diaphragm.

66. (Previously Presented) The spherical semiconductor particles mass-producing method of claim 64, wherein the vibrating means comprising:

a driving chamber that is connected to the space over the semiconductor in the crucible, and

a driving source for oscillating a pressure inside the driving chamber.

67. (Previously Presented) The spherical semiconductor particles mass-producing method of claim 51, wherein the vibrating means vibrates the crucible.

68. (Previously Presented) The spherical semiconductor particles mass-producing method of claim 51, further comprising:

exerting Lorentz force on the molten semiconductor dropping from the nozzle and thereby forming particles through a pinch effect of decreasing a cross-section of the molten semiconductor by Lorentz force generating means.

69. (Previously Presented) The spherical semiconductor particles mass-producing method of claim 51, further comprising:

heating liquid or solid particles dropping from the nozzle in the vapor phase to control a cooling rate thereof and thereby converting the particles into single-crystal or polycrystalline particles.

70. (Previously Presented) The spherical semiconductor particles mass-producing method of claim 69, further comprising:

causing crystalline semiconductor particles of one conductivity type to pass through a passage in a material gas containing atoms or molecules with which the crystalline semiconductor particles are to be doped, and thereby forming a surface layer of the other conductivity type on each of the crystalline semiconductor particles.

71. (Previously Presented) A spherical semiconductor particles mass-producing method comprising:

crystallizing step for heating liquid or solid particles existing in a vapor phase by crystallizing means and thereby converting the particles into single-crystal or polycrystalline particles.

72. (Previously Presented) The spherical semiconductor particles mass-producing method of claim 69 or 71, wherein the crystallizing means is a laser source for applying laser light to the particles.

73. (Previously Presented) The spherical semiconductor particles mass-producing method of claim 69 or 71, wherein the crystallizing means is a radiation heat source provided adjacent to a passage of the particles, for heating the particles by radiation heat.

74. (Previously Presented) The spherical semiconductor particles mass-producing method of claim 72, wherein the crystallizing means heats the particles so that the cooling rate of the particles has a gentle profile, to thereby prevent development of cracks in the particles and prevent the particles from becoming amorphous.

75. (Previously Presented) A spherical semiconductor particles mass-producing method comprising:

causing crystalline semiconductor particles of one conductivity type to pass through a passage in a material gas containing atoms or molecules with which the crystalline semiconductor particles are to be doped, and thereby forming a surface layer of the other conductivity type on each of the crystalline semiconductor particles.

76. (Previously Presented) The spherical semiconductor particles mass-producing method of claim 70, wherein the passage extends in a vertical direction and surface layer diffusion is performed as the crystalline semiconductor particles drop through the passage.

77. (Previously Presented) The spherical semiconductor particles mass-producing method of claim 76, wherein the crystalline semiconductor particles on which a diffusion agent is deposited by passing through the passage are heated to form thereon a surface layer having a desired thickness.

78. (Previously Presented) The spherical semiconductor particles mass-producing method of claim 70, wherein the semiconductor is silicon.

79. (Canceled)

80. (Canceled)

81. (Canceled)